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# Calibration of a diode laser water isotope ratio spectrometer for *in-situ* measurements in the troposphere and lower stratosphere:

# Using a piezo-injector to produce water with know concentration and isotopic signature in the laboratory

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### 0.1.1 Abstract

We report on a laboratory calibration system for a near-infrared diode spectrometer. The instrument is designed to measure *in-situ* the water deuterium and oxygen ($^{17}$O and $^{18}$O) isotope ratios from the low troposphere up to the lower stratosphere with a high temporal resolution. The spectrometer is based on ultra-sensitive optical-feedback cavity enhanced absorption spectroscopy.

To calibrate our device, we used a nozzle injector (Microdrop GmbH) to inject water droplets of known size at a preset repetition frequency into a stream of dry nitrogen or synthetic air. The micro-dispenser technology is based on the same principle as inkjet printer nozzle technology. A piezo actuator surrounds a glass capillary, ending in a nozzle of 30 $\mu$m diameter, able to generate a volume of 100 pL, corresponding to a drop size of 45 $\mu$m. Complete evaporation of the small droplets assures that there is no isotopic fractionation between the liquid phase and the generated moist "air". The water mixing ratio of the synthetic air is controlled by the repetition rate and gas flow.

The current system spans a water mixing ratio range from 15 to 17000 ppmv, representing the range of conditions expected in the lower stratosphere to the low troposphere.

We will show results on the linearity of the nozzle injector, the droplet size calibration, and the time-response of our laser spectrometer.